5913

One of the state's greatest assets lies in its natural resources -- its oil, gas, sulphur, salt, helium, wildlife, and timber. Another thing that could be classed as a natural resource is the Texan's ability to brag long and loud about all the things we have that are bigger and better than anybody else's. However that may be, the state is always coming up with a "first" or "biggest" in one thing or another.

This enormous, symetrical tree is located in Cherokee County near the town of Alto. Residents of the area claim it to be the largest holly tree in the world. Holly to most people is a small shrub that can be planted beside the house and used as a part of festive Christmas decorations. Few realize that in its native state, it can attain the size and beauty shown here.

According to the Texas A & M College Forest Service, native holly is found growing in the rich damp soils of East Texas bottomlands as far west as Wilson County. A tree often 50 feet high, it not infrequently attains heights of 80 to 100 feet and trunk diameters up to four feet. Surely something to brag about. Think of how many Christmas wreaths one tree would make.

The light, tough, white wood is much valued and used for cabinet making, interior finish and turnery, and many of the biggest and best holly trees have been cut and marketed. If this is true, then this tree could very well be the biggest and best holly left in the State of Superlatives.

About the Cover . . .

We of the staff of TEXAS HIGHWAYS want to take this opportunity to wish all our readers A Very Merry Christmas in the old-fashioned tradition and a Happy New Year full of promise and fulfillment.

VOL. II

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TEXAS Highways

The purpose of this publication, "Texas Highways," is to furnish a medium for presenting practical ideas and information. Employees are invited and urged to submit suggestions and relate experiences which would benefit or be of interest to Highway employees. These conclusions and data are not necessarily endorsed by the Highway Department nor are they to be construed as instructions.

Photographic services are available and other assistance may be obtained, if desired, in preparing material for submission. All material and comments should be directed to the Information and Statistics Division, Austin 14, Texas.

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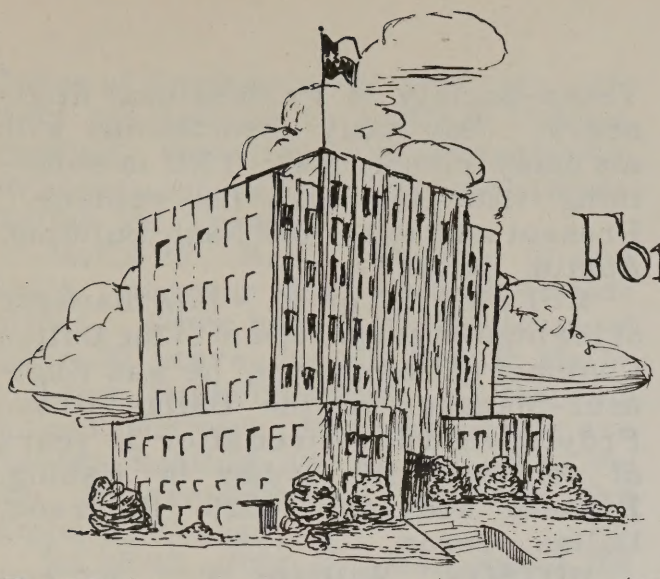
COMPILED AND EDITED
Information and Statistics Division



Former Employees

Where Are They Now ?

Over the past years, many of the Highway Department employees have left for retirement and other reasons. While some of these men are no longer active in the building of our highways, they are still interested in the progress of the Department and the doings of its personnel. To bring these men up to date on each other's whereabouts, and to let their many friends in the Department know where they are, Texas Highways has attempted to collect information on where our retired members are now and what they are doing. The replies received so far are listed here, in alphabetical order. As more are received they will also be published in the magazine.

BACON, Sumner D., was with the Department for 24 years, serving finally as Senior Resident Engineer in the Dallas District. At the present time he says he is associated with chemical engineering and land use and real estate developments. His hobbies are working in his home workshop, fishing, and deuces wild. Present address: 6816 Hillcrest Avenue, Dallas, Texas.

BUSHFIELD, W. C., with the Department for 30 years, also was a Senior Resident Engineer, in the San Antonio District. He is now with Jack Freeland and Company as engineer and estimator in the construction of bridges, culverts, storm drainage, etc. He sends his regards to all old friends with the Department and elsewhere. Present address: 6637 West Commerce, San Antonio 7, Texas.

CLINGER, Carl E., served 30 years with the Department, finally as Senior Contracts Estimate Engineer. He is now in bonds and insurance, and lists his hobbies as penny poker, football, and friends. Sends his regards to all. Present address: 1704 Alameda Drive, Austin, Texas.

COLLOM, Clarence B., former Senior Urban Engineer with the Fort Worth Urban Project, was with the Department for twenty years. At present Collom is employed as Resident Engineer by Freese and Nichols on the construction of bridges for Tarrant County Water Control and Improvement District 1. Present address: 2212 Yucca Avenue, Fort Worth 11, Texas.

DAVIS, Thomas C., was District Engineer of the Corpus Christi District when he retired after over 30 years of service. Now he is consulting engineer for the Comite Edecutivo de Vialidad of the State of Guayaquil, Ecuador, S. A. Previous to beginning work in Ecuador the first of August, he was with the Hot Mix Association. Present address: Casilla No. 4182,

Guayaquil, Ecuador, S. A.

DICKSON, John L., retired at the end of 21 years. He was Engineer-Manager of the San Antonio Urban Project. He is now engaged in civil engineering and gives his business address as 215-A Kallison-Walsh Building, San Antonio, and his resident address as 362 Mandalay Drive West, San Antonio, Texas.

DREW, Andrew E., retired as Senior Designing Engineer with the Paris District after 30 years of service. He says he is now fishing, and "we are enjoying Washington and Oregon scenery for the first time." Present address: The Trees Trailer Park, Vancouver, Washington.

ELDER, Herbert W., was Supervising Urban Engineer of the Houston Urban Project when he retired after seventeen years of service. At present he is a partner in the firm of Norris and Elder, Consulting Engineers. His hobby is gardening when he has time from work. His firm specializes in the design of highways, bridges, and drainage projects. Present address: 1739 Harold, Houston 6, Texas.

ELDRIDGE, Herbert, was Chief Engineer of Planning when he left the Department after 32 years of service. At the present time he is Director of Highways, Arkansas Highway Department. Present address: 6021 Longwood Road, Little Rock, Arkansas.

FINLEY, George B., retired after 23 years with the Department. He was Maintenance Engineer when he left. At present, he says he is an agriculturist, or was, "until the bugs - big and little - and the dry weather took over, and now I am just a plain farmer, with no crops." Present address: 2315 Quarry Road, Austin, Texas.

GARRETT, George M. - After 30 years with the Department, he retired as Engineer-Manager of the Fort Worth Urban Project. Now he is Special Highway Engineer for the Portland Cement Association. Present address: 2901 Fifth Avenue, Fort Worth 10, Texas.

HARKLEROAD, Henry - After more than 33 years of service, he retired as Assistant Bridge Engineer. Now he is Executive Secretary of the Texas Society of Professional Engineers. "My daily associations with my many friends of the THD is something that time will not replace." Present address: 403 Nash Building, Austin, Texas.

HUFFMAN, Tom E. - Now manager of the highway department of the Dallas Chamber of Commerce, he was Engineer-Manager of the Dallas Urban Project when he retired after 31 years of service. His hobby is fishing. Present address: 4525 Emerson, Dallas, Texas.

HUTSON, William F., retired after 26 years with the Department. He was Senior Resident Engineer of the Austin District at the time of his retirement. He has been working for the Department of Public Works of the City of Austin. "I was 80 in August and am planning on resigning and doing a lot of visiting relatives and friends." Present address: 302 East 32nd, Austin 5, Texas.

ISBELL, J.M. - After 31 years with the Department, he retired as District Engineer of the Wichita Falls District. His hobbies are traveling, reading, flowers, and seeing friends. Present address: 1914 Tilden Street, Wichita Falls, Texas.

KEMPEN, George J. Jr. - Senior Resident Engineer in the El Paso District when he retired, Kempen had been with the Department 31 years. Doing private work when his health permits, he says "the front door is always open" to his friends of the Highway Department and he especially invited George Finley and Percy Bailey to come by. Present address: Box 625, Alpine, Texas.

LOVE, Andrew Cavitt - After 25 years of service, he retired as Senior Research Engineer with the Materials and Tests Division. Now devotes his time to Boy Scouts and Indian lore. Visits with Indian friends in New Mexico, Arizona, and Oklahoma each summer. Present address: 2292 Broadway, Beaumont, Texas.

MADDOX, Edward F., was Senior Resident Engineer of the Dallas District when he retired after 30 years of service. He is now Construction Management Engineer, Operations Division, Southwestern Division,

Corps of Engineers, U. S. Army. He lists his hobbies as hunting, fishing, reading, traveling, and photography. Present address: 7313 Tokalon Drive, Dallas 14, Texas.

McCABE, H. W. (Micky), is now sales engineer for White's Uvalde Mines. When he left the Department after 30 years, he was Senior Maintenance Superintendent of the San Antonio District. His hobbies now are fishing, hunting, and loafing off of the job. Present address: 240 Argo, San Antonio. Texas.

NABERS, John B., was one of the very few 35-year men when he retired in 1952. He then was District Engineer of the Wichita Falls District. At present he is consulting engineer for the City of Vernon, working on the construction of large water and sewer improvements. Present address: Vernon, Texas.

PERCIVAL, Fred M., was Senior Resident Engineer in the Pharr District when he retired. Now he occasionally does small surveys and makes various local maps. At 84, he reports that he is still in good health, and enjoys seeing some of his former projects now maturing. Present address: P. O. Box 422, Rockport, Texas.

PETERMAN, L. A., served 26 years with the Department, retiring as Senior Resident Engineer of District 17 at Bryan. He now is looking after oil and gas interests in Brazoria and Galveston Counties. Present address: Box 407, Alvin, Texas.

THOMSON, Walter A., was Senior Resident Engineer of the Lufkin District when he retired after 21 years with the Department. At the present time he is County Engineer of Nacogdoches County. Present address: P. O. Box 6, Nacogdoches, Texas.

WYNN, Byron W., spent 30 years with the Department, retiring as Senior Resident Engineer of the San Angelo District. Spends his summers at Chipita Park in Colorado. Wood working is his principal hobby and "also do some crocheting. (Such a manly art.)" Present address: Box 72, Chipita Park, Colorado, summer. 2301 Houston, San Angelo, Texas, winter.

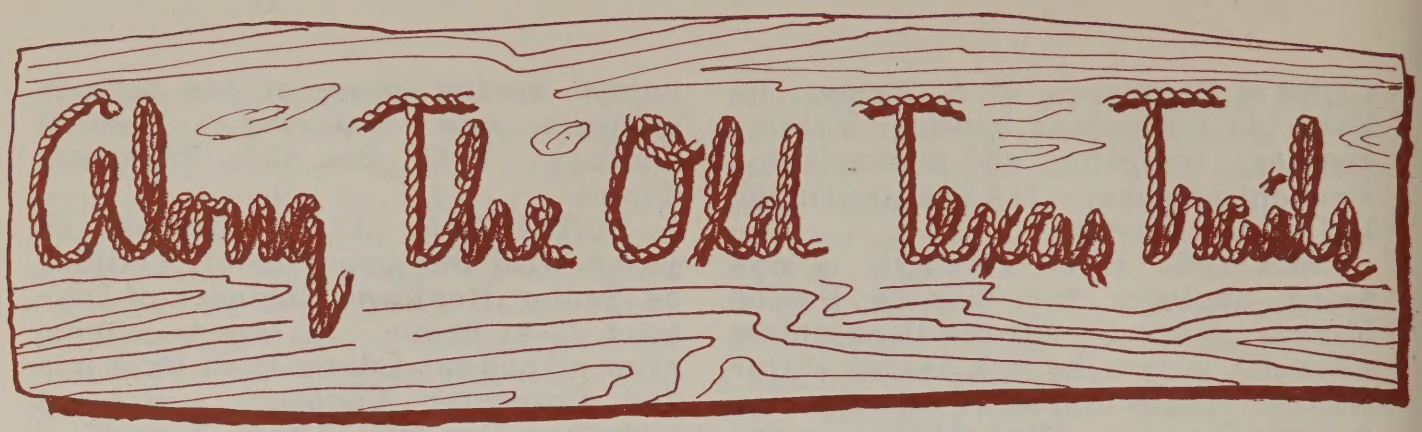
● ● ●

WE DIDN'T KNOW WHERE TO DRAW THE LINE - - -

On page 167 of the November Texas Highways, brackets were placed wrong in Equation 4 of Frank Scrivner's speech. The equation should have read

$$x = \frac{1}{a}\left[\frac{v-v_o}{g} + (\sin\Theta - b)t\right] \qquad (4)$$

$$\text{when } t = \frac{1}{ag}\log\left(\frac{av + b - \sin\Theta}{av_o + b - \sin\Theta}\right)$$



"Gather 'round me, everybody, and listen to my tale,
I'll tell you of my troubles on the Old Chisholm Trail."

So sang the cowboy as he rested at night from the strenuous work of herding cattle to market over the long trail.

Men no longer drive cattle to Northern markets along the old cattle trails. Yet these trails played a tremendous role in shaping the destiny of Texas. Most of these old cattle trails follow, cross, and recross our present-day highways at many points.

Literally pushing back the frontier, the trails brought prosperity to Texas and to the towns which sprang up along the way. Perhaps even more important, they brought color and vigor, and a new concept of values in the political, economic, and social systems of this country. The history of the golden era of the cattle drives has been preserved largely in songs sung throughout the world from opera houses to barrooms.

Only the best men of the range went on the drives. These were men who possessed courage and common sense, and who were experts at their jobs. They were strong, tough men - - they had to be.

As a rule, one man was needed for approximately 75 head of cattle, and the herds often numbered in the thousands. Under normal conditions, the more experienced riders were placed toward the front. The hours were long, and the work often extremely dangerous, but the pay was usually a little better than that received for regular range riding.

Although the first Texas cattle drives are not recorded, it is known that cattle were driven to Louisiana before the Texas Revolution. Cattle were often gathered on the frontier and sold in plantation settlements.

In a way, the Longhorns produced the Texas cowboy. In the 1840's these cattle were first marketed in other states and their popularity grew. They were tough, able to forage for themselves and able to stand the rigors of trail drives. However, as better breeds developed, the demand for Longhorns waned. Today there are but a few left as reminders of the old days of the open range.

The early cattle drives carried just enough equipment to provide the bare necessities for man and beast. Later, more comforts and conveniences were provided for the drivers. It was about this time that the statement made by Napoleon that an army moves on its stomach was applied by some rancher to the small "army" of riders needed for handling the giant herds. Out of that idea came the "chuck wagon" which was eventually to become an institution in ranch activities.

There were a vast number of trails in use by the Nineteenth Century. The Old Spanish Trail, the Santa Fe Trail, the Goodnight-Loving Trail, the Pecos Trail, the Montana Trail, the Shawnee Trail, the Jones-Plummer Trail - - these are but a few.

Probably the most famous of them all, though, is the Old Chisholm Trail. It may not seem impressive today, but once it served a vital need, and performed a valuable service to Texas cattlemen.

Jesse Chisholm, the well-known

half-breed Cherokee plainsman and scout who reportedly spoke fourteen Indian languages, ran a trading post at Wichita, Kansas. For some reason, he decided to transport some goods from Wichita to Council Grove, Oklahoma, in 1865. Unknown to him, he was blazing the trail which would be followed by ranchers in driving millions of Longhorn steers to market. This route was the forerunner of the Old Chisholm Trail.

A man identified only as Captain Spekes took the first herd of cattle northward over the wagon tracks left by Chisholm. Perhaps it was he who named the trail after Jesse Chisholm. Other trail drivers followed, and soon the trail became a cattle "highway."

A broad, beaten thoroughfare several hundred yards in width, offering plenty of grass, a large number of fordable streams, and level ground, it was soon one of the most popular trails. It provided a means of transporting herds part of the 800 miles from San Antonio to the railhead in Abilene, Kansas. The Texas extension of the Chisholm Trail reached from the Rio Grande through twenty counties, leaving the state in Montague County. Herds were driven northward from the Red River just north of the town of Ringgold, Texas, and then across Oklahoma to Abilene, Kansas, which was as far south as the railroad went.

If ever a town had the flavor, the spirit of the cattle business, it was Abilene, with its numerous saloons, its bustling activity, its prosperity. It was a rough, raw town, but it was exciting and vigorous. It was a place of lights, of fights, of music, of relaxation.

The trail riders established quite a reputation for their profession as a result of their sprees in the towns after being on the trail for two or three months. People often failed to realize that these gentlemen of the equestrian art were usually hardworking, efficient, dependable men in spite of their desire to let off a little steam and live it up when the opportunity presented itself. A cowboy knew how to have fun, all right, but he knew how to work too. He could do the work of three men, if necessary, and he had the ability to cope with any situation.

The one constant threat feared most by the cattleman was the dreaded stampede, which caused several days' delay while cattle were regrouped. Each man had a horse saddled and ready at all times in case of a storm, stampede, or other emergency. After the first few days the herd became more accustomed to the drive, and the danger of a stampede decreased. The old-timers always contended, though, that a herd which had once stampeded would do the same thing again.

The greatest danger was on dark and stormy nights. A flash of lightning might terrify the Longhorns and start a stampede. Under these conditions the cowboys ate in shifts, leaving the majority on duty to watch the herd. One never knew what might start a stampede. The rustle of the wind across the grass could do it. There were always a few steers who led the herd, and the cattle would follow these leaders blindly during a stampede.

The first ten days, the herd was usually pressed to 20 or 25 miles a day to trail break the cattle and make them so tired they would lie down at night.

After this, most drives averaged twelve to fifteen miles a day. Most of the day's mileage came between morning and afternoon grazing and watering.

Early in the spring, the herd left Texas. The grass was beginning to grow then, providing food for the cattle, to fatten them along the way; this early start allowed adequate time to get the cattle to market before cold weather if the trip was a long one.

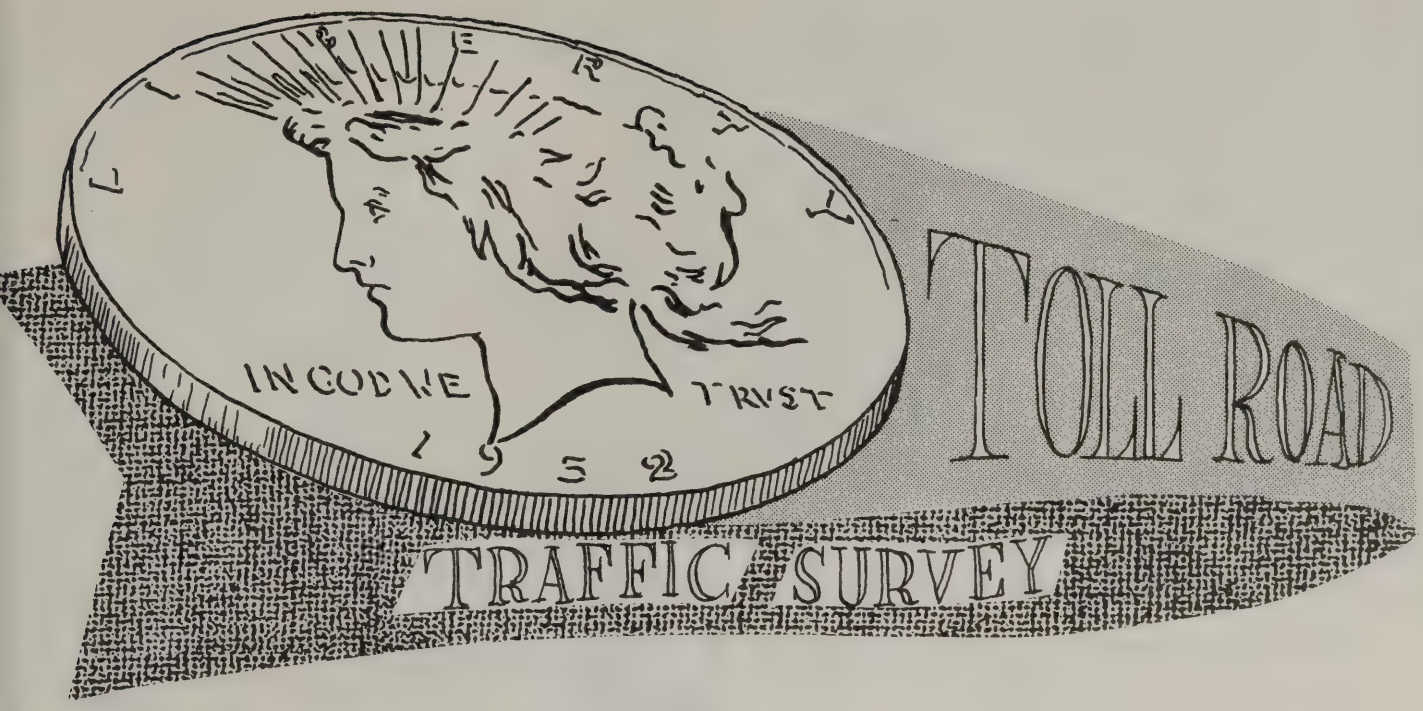
As the railroads passed Abilene, extending farther south, the drives became shorter. And in 1871, Kansas quarantine laws completely cut off Abilene, Salina, and Ellsworth from the cattle trade. Settlements sprang up along the routes of the railroads, blocking the Chisholm Trail.

The days of the open range were passing, with fenced ranches taking their places and further cutting off the trail from the cattlemen. All the terminal points of the trail were excluded from the Texas trade of 1877. But the brief time the Chisholm Trail functioned was long enough for it to leave an indelible print upon the culture and literature of Texas.

One lasting contribution of the Texas cowboy was his songs. He sang often at night during the long drives. Some say he sang to soothe the herd, or perhaps to minimize the startling effect of sudden noises. Or maybe he was lonely, or a bit afraid of the lurking darkness -- though few trail drivers would have confessed to fear of anything. Whatever the reason, the old cowboy ballads have become a lasting part of American culture.

The days of the old cattle drives are gone forever. Modern, streamlined highways have replaced the old trails. Yet these routes -- the Old Chisholm Trail, the Old Spanish Trail, the Western Trail, and the others -- all played a vital role in shaping the destiny of Texas and in coloring its culture, and they remain an unforgettable stage in the growth of the state.

This colorful and romantic era produced legends, characters, fortunes, and heartbreaks, most of which have long since been erased by time. But it gave the world an everlasting gift in the cowboy ballad. What better epitaph could a passing generation leave behind?



J.E. Wright, Traffic Survey Manager
Highway Planning Survey Division

In connection with the preparation of a final feasibility report for the proposed Dallas-Fort Worth Toll Road, it was necessary to obtain current origin-destination data on which to base assignments of traffic to the proposed road.

The firm of Coverdale and Colpitts, Consulting Engineers, was engaged by the Texas Turnpike Authority for this final feasibility study and report. Arrangements were made whereby Highway Planning Survey, Traffic Section, would make the origin-destination survey and furnish the field data to the consulting firm for analysis.

For this type study, it was necessary to obtain traffic movements for weekdays, Saturdays, and Sundays. In view of these requirements the survey was planned for 96 continuous hours of operation at selected points on all routes serving traffic between Dallas and Fort Worth. This involved station locations on S. H. 183 east of the intersection with S. H. 356, on S. H. 356 southeast of the intersection with S. H. 183, on U. S. 80 at the west city limits of Arlington, and on Jefferson Boulevard at the west city limits of Grand Prairie.

Temporary office space was obtained from the City of Dallas in the old Public Works Building on Cedar Springs Road. Personnel from the Traffic Section of the Highway Planning Survey served as station and office supervisors. All other personnel, amounting to approximately 120 people, were hired on a temporary basis in Dallas, the majority coming from Southern Methodist University.

To be able to obtain traffic movements for weekdays, Saturdays, and Sundays, field operations were set up to begin on Thursday at 6 A. M. and run for 96 continuous hours, through Monday at 6 A. M. Each of the four 24-hour periods involved in this operation was divided into three eight-hour periods or shifts, 6 A. M. to 2 P. M., 2 P. M. to 10 P. M., and 10 P. M. to 6 A. M. Due to the heavy volume of traffic on routes between Dallas and Fort Worth, personnel required to obtain origin-destination information and to keep traffic moving was, by necessity, high. The 6 A. M. to 2 P. M. and the 2 P. M. to 10 P. M. shifts required 40 men each and the 10 P. M. to 6 A. M. shift required 20 men. A total of 100 men was needed

A trailer bunkhouse with bunks removed was converted into a field office and parked at the survey station on U.S. 80, west city limits of Arlington.

Pictured is the survey station on U.S. 80 during daylight hours. A maximum of 36 vehicles could be interviewed simultaneously.

A view of the survey station during a momentary lull. A manual recorder makes a directional vehicle classification count.

During night operation, 4,800 watts of light are used across and on the shoulders of the highway. Lights were powered by a portable 5,000 watt, gasoline driven, D.C. generator.

A chartered bus was used to transport personnel to and from survey stations.

There were 163,158 interviews coded and checked in this office.

for each 24-hour period. The large number of personnel involved and the distance to field operations presented a problem of transportation. This problem was solved by use of a chartered bus. The bus was scheduled to leave a central point in Dallas (Union Bus Station) one hour before shift change and return to the central point after the change, also scheduled stops were made en route.

Field operations started on Thursday, June 3, at the stations on S. H. 183 and S. H. 356; on Thursday, June 10, at the station on U. S. 80; and on Thursday, June 17, at the station on Jefferson Boulevard. The field procedure used in conducting the survey consisted of interviewing the drivers of vehicles moving in both directions to determine trip origin, destination, and purpose, and location and purpose of stops made between Dallas and Fort Worth. Vehicle classification counts were made also in connection with the interviews. For night operation, a 5,000-watt portable D. C. generator furnished power for 25 200-watt bulbs strung across the roadway and along the shoulders. Stabilized and surfaced shoulders nine feet wide and 250 feet long were constructed at station locations on U. S. 80 and S. H. 183 to provide a safe operation for the volume of traffic handled. A trailer bunk house, obtained from the Equipment and Procurement Division, was converted into a field office and used at each of the survey stations for all necessary field office work, storage space for spare interview forms, and supplies needed for station operation.

During the period of operation 167,575 vehicles passed through the survey stations. Origin-destination data were obtained from 163,158 or 97 per cent of these vehicles.

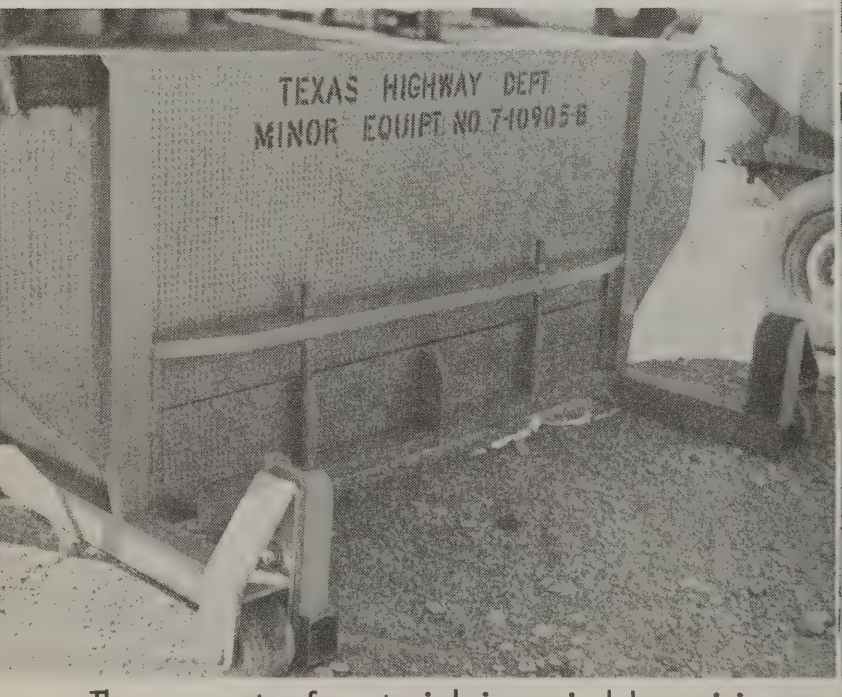
A small force of personnel was maintained at the temporary office immediately preceding and during field operations to make a coding index of Fort Worth and bring the Dallas coding index up-to-date. No field work was done on Mondays, Tuesdays, and Wednesdays. On these days field and office personnel were used to count, check, and code the completed interview forms. After field work was completed Monday, June 21, most of the field personnel and all of the office force - - approximately 80 people - - continued the counting, checking, and coding. The preliminary arrangements for the origin-destination survey were started May 17, and the final completion date for the entire job was June 30.

DRAG SPREADER BOX

R.N. Jennings, Maintenance Engineer
District 7

District 7 uses a drag spreader box to put out aggregate for road mixes or asphaltic leveling material. It is believed that this box gives uniform distribution with a minimum amount of blading.

The accompanying photographs illustrate the main features of this box which was constructed in our district shops at an approximate cost of $300. Nearly all maintenance sections in District 7 have been furnished one of these boxes.



The amount of material is varied by raising or lowering the gate.

Hooks are used to latch on to standard spreader box hitches.

SAND DRAINS

James L. Baker, Senior Resident Engineer
District 12

Farm Highway 1460, which originally began in Velasco and terminated at Surfside Beach after crossing the Intracoastal Canal, has been relocated and now begins at a point on Farm Highway 523 about two miles north of Velasco and ends at Surfside Beach, some three and three-fourths miles southeast. The crossing of the Intracoastal Canal on the old road consisted of a movable pontoon bridge which was grossly inadequate for the frequent load of more than 4,500 v.p.d., and was exorbitantly expensive to maintain. The relocation of this route was brought about by the inadequacy of this old barge crossing.

Construction of a high-level bridge with vertical clearance of 77 feet above normal tide at midpoint of the canal was recently completed. The route of the new location is through a wide tidal flat with the customarily weak soils predominating for depths up to 20 feet. The upper layer of earth on most of this route is composed of soil so weak that the ordinary considerations relative to economic balance of bridge length and high fills do not apply.

The top 16 to 20 feet of soil in this area was found to have a moisture content of from 30 to 60 per cent, and a computed dry weight of from 55 to 75 pounds per cubic foot. For an average condition, this soil was found to have the following soil constants: LL = 64, PI = 39, LS = 21. Studies made by D-8, the Design section of District 12, and this office indicated that the existing soils would possess adequate strength to successfully support a fill of moderate height if the moisture content could be lowered substantially.

Based on leads furnished from other areas where this problem has been encountered, our decision was to try vertical sand drains to collect water forced from the soil as consolidation due to embankment loads occurred. Eighteen-inch vertical sand drains spaced at ten-foot intervals were proposed for all areas under the embankment between crown lines for fill heights of twelve feet and more. All the area of the natural ground under the embankment was covered with a blanket of sand for a minimum depth of eighteen inches. This blanket of sand was placed to provide a means for lateral flow of water when it reached the top of the sand drains.

Beach sand of suitable gradation for the purpose at hand was easily available and was used in this work. The question of drilling holes to a depth of 20 feet in these unstable soils was of a somewhat intangible nature. It was

Pictured here are laborers filling subdrain holes with beach sand.

decided to provide a force account item in the contract for the performance of this work. It later developed that most of the holes could be drilled and filled without forced use of casing. If future projects of this nature are done here, we will use bid prices rather than force account for this item. The cost of the drain, complete with sand fill, was approximately 75 cents per linear foot.

We designed a device for measuring the settlement of the natural ground which was made up in the District Shop. You will note in the pictures that the stem was designed to permit increase in height by adding sections of two-inch pipe in one-foot increments. This pipe was capped at all times except when the actual measuring was being done. Measurement was a simple operation consisting of the insertion of a steel rod into the shaft to the base plate, and computation of elevation from direct rod readings on the top of the steel rod.

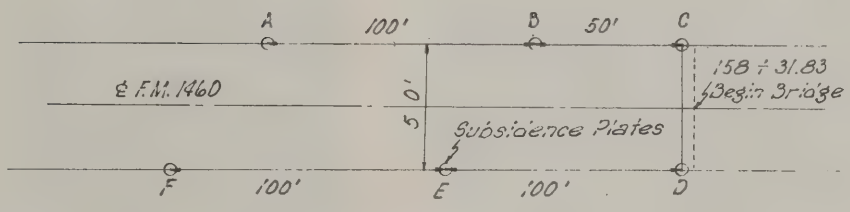
Pictures showing drainage through the sand blanket illustrate the apparent effectiveness of the vertical sand drains. Charts and sketches show the

settlement of the foundation as the fill height increased and the settlement which has occurred since the base and surface have been completed. A research project has been authorized to continue investigation relative to the technical phases of soil mechanics involved in this particular project. A more comprehensive report covering this phase will be submitted at a later date. We hope to obtain sufficient data to permit a logical conclusion regarding the effectiveness of sand drains.

This plate is used in measuring the subsidence of foundation soil. The base plate is made from one-fourth inch plate three feet square.

The vertical stem projecting from the subsidence plate shows the method of extending two-inch pipe well.

RECORD OF SUBSIDENCE
CAUSED BY EMBANKMENT CONSTRUCTION
AT BEGINNING OF INTRACOASTAL CANAL BRIDGE

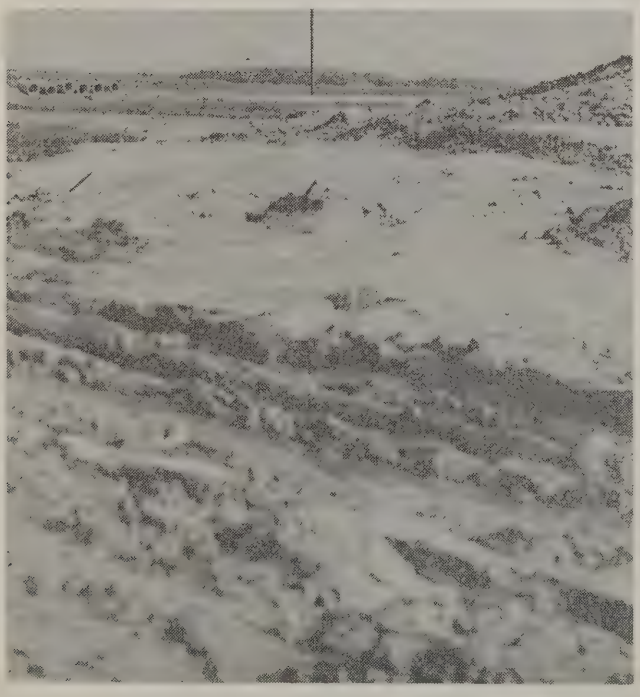


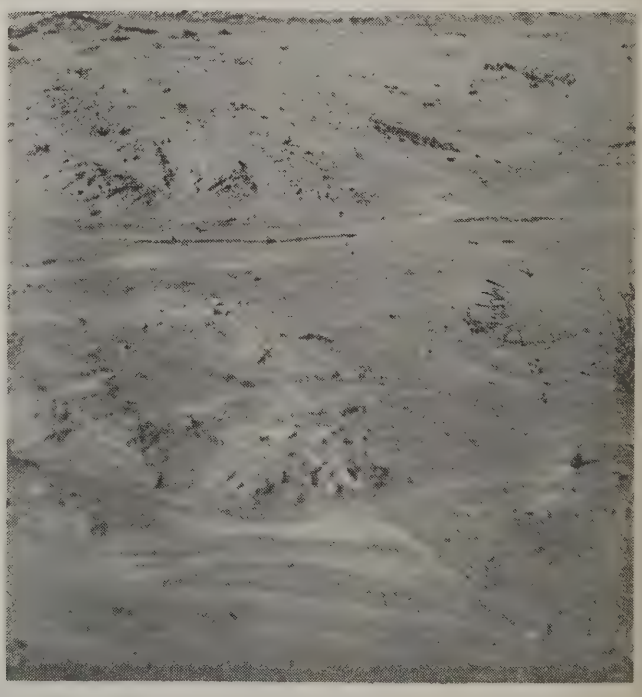
Location Plat

	ELEVATIONS												
	A		B		C		D		E		F		
Date	P.L.	Embk.	P.L.	Embk.	P.L.	Embk.	P.L.	Embk.	P.L.	Embk.	P.L.	Embk.	
6-4-53	4.39	5.7	4.07	5.7	4.04	5.3	3.72	5.5	4.05	4.8	3.75	5.0	
6-10	4.38	6.7	4.05	6.8	4.04	6.4	3.71	6.4	4.03	6.3	3.73	6.2	
6-16	4.36	7.5	4.03	7.8	4.01	7.8	3.71	7.1	4.03	7.1	3.71	7.3	
6-22	4.28	9.1	3.95	8.9	3.95	8.9	3.66	8.2	3.96	8.2	3.69	7.5	
6-25	4.28	9.7	3.95	9.8	3.93	9.8	3.63	10.1	3.94	9.6	3.68	9.1	
7-18	4.04	12.0	3.69	11.6	3.69	11.9	3.43	11.9	3.81	11.5	3.45	11.5	
7-28	3.93	12.5	3.61	12.6	3.60	12.7	3.35	12.5	3.62	12.4	3.33	12.4	
8-13	*	13.2	3.38	15.7	3.36	16.1	3.10	16.2	3.41	14.2	3.16	12.4	*Pipe
8-22	*	13.8	3.29	19.0	3.27	18.1	2.96	19.4	3.36	16.1	3.16	12.6	Broken
9-10	3.71	13.7	3.10	19.7	3.08	18.5	2.77	18.9	3.20	15.9	3.12	13.3	
9-18	3.69	14.4	3.04	19.2	2.99	21.2	2.72	20.9	3.15	16.8	3.11	13.1	
10-14	3.57	15.1	2.90	20.4	2.85	21.3	2.59	21.7	3.07	17.9	3.04	12.9	
12-7	3.43	15.8	2.72	21.0	2.68	20.7	2.43	21.4	2.81	18.3	2.86	13.9	
5-26-54	3.34	17.8	2.56	23.0	2.53	22.7	2.31	23.4	2.66	20.3	2.75	15.9	*

* These elevations taken after completion of Embankment, Roadbed Treatment, and Base.

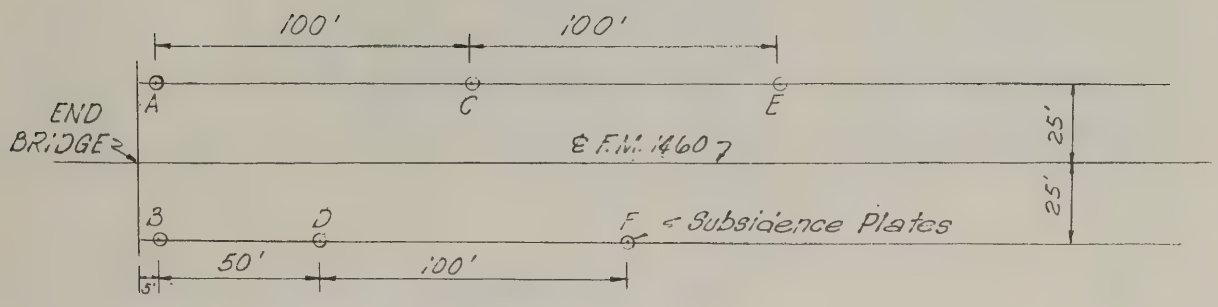
Seepage from sand subdrains is shown traveling through sand blanket to toe of slopes.





These views show the method of measuring subsidence. The one-half inch steel rod extends through pipe well to base plate.

RECORD OF SUBSIDENCE CAUSED BY
EMBANKMENT CONSTRUCTION AT END OF
INTRACOASTAL CANAL BRIDGE



LOCATION PLAT

DATE	TIME	ELEVATIONS												
		A		B		C		D		E		F		
		P.L.	Embk.	P.L.	Embk.	P.L.	Embk.	P.L.	Embk.	P.L.	Embk.	P.L.	Embk.	
12-10-52	4 PM	3.23	---	4.05	---	3.69	---	4.08	---	---	---	3.98	---	
12-11	3 PM	3.18	5.8	3.96	6.3	3.62	6.5	3,98	6.6	3.69		3.88	6.4	
12-12	2 PM	3.18	5.7	3.98	6.5	3.64	6.5	4.00	6.6	3.64	7.8	3.90	6.7	
12-18	3 PM	3.14	5.9	3.96	6.3	3.57	7.5	3.99	6.5	3.48	8.5	3.85	7.8	
12-20	11 AM	3.17	7.6	3.98	8.1	3.58	9.9	3.99	9.6	3.62	10.3	3.88	10.5	
12-22	2 PM	3.25	10.9	4.00	9.6	3.59	11.2	4.00	10.6	3.62	11.0	3.88	11.3	
12-23	2 PM	3.14	11.9	3.95	11.9	3.55	13.2	3.94	12.9	3.61	11.5	3.85	12.2	
12-29	12 N	2.97	14.4	3.77	14.4	3.40	14.6	3.76	15.4	3.58	12.1	3.77	13.2	
12-30	2 PM	2.95	14.3	3.75	14.5	3.38	14.5	3.71	15.0	3.55	12.1	3.77	13.2	
1-3-53	12 N	2.73	17.8	3.53	19.0	3.29	15.2	3.53	17.4	3.57	11.9	3.69	13.3	
1-6	3 PM	2.65	18.0	3.43	19.1	3.25	15.1	3.44	19.7	3.55	11.9	3.61	16.3	
1-8	11 AM	2.65	18.6	3.42	19.0	3.22	17.2	3.41	19.6	3.55	12.8	3.61	16.0	
1-12	3 PM	2.53	19.0	3.29	19.1	3.16	17.0	3.32	19.4	3.51	13.2	3.52	15.7	
1-14	11 AM	2.50	20.3	3.26	21.0	3.13	18.0	3.28	20.2	3.49	13.7	3.52	15.4	
1-20	3 PM	2.30	22.1	3.07	22.6	2.99	19.2	3.09	21.2	3.39	14.2	3.39	16.0	
1-26	3 PM	2.28	22.2	3.05	22.6	2.98	19.0	3.08	21.3	3.36	14.7	3.39	16.3	
2-3	10 AM	2.16	22.1	2.93	22.6	2.88	18.7	2.97	21.2	3.32	14.4	3.34	16.2	
2-13	9 AM	2.02	22.0	2.80	22.3	2.76	18.4	2.84	21.0	3.22	14.0	3.24	16.1	
2-20	10 AM	2.02	22.0	2.81	22.2	2.76	18.4	2.87	21.0	3.24	14.1	3.25	16.1	(Very Windy)
2-27	10 AM	1.98	22.0	2.77	22.2	2.73	17.8	2.81	21.0	3.19	14.2	3.24	16.1	
3-7	11 AM	2.01	21.9	2.80	22.2	2.74	18.4	2.83	20.8	3.20	14.1	3.24	15.9	
3-13	11 AM	2.01	22.0	2.78	22.2	2.80	18.5	2.86	20.8	3.20	14.1	3.26	16.1	
3-20	11 AM	1.98	21.9	2.77	22.3	2.73	18.4	2.82	20.8	3.20	14.1	3.24	15.9	
3-27	10 AM	1.97	21.9	2.76	22.2	2.73	18.3	2.81	20.7	3.19	14.1	3.23	16.0	
4-3	11 AM	1.96	21.9	2.74	22.2	2.72	18.3	2.80	20.7	3.19	14.0	3.22	16.0	
4-10	11 AM	1.93	21.9	2.73	22.3	2.71	18.3	2.78	20.8	3.17	14.1	3.20	15.9	
4-18	11 AM	1.93	21.8	2.73	22.3	2.70	18.3	2.78	20.8	3.17	14.0	3.20	15.8	
5-13	11 AM	1.90	21.9	2.70	22.3	2.69	18.1	2.76	20.9	3.15	14.0	3.18	15.6	
6-16	11 AM	1.89	22.2	2.70	22.4	2.69	18.0	2.75	20.9	3.15	13.8	3.17	15.7	
7-18	11 AM	1.88	22.3	2.70	22.3	2.69	18.3	2.77	21.3	3.13	14.0	3.15	15.9	
8-22	11 AM	1.85	22.3	2.65	22.3	2.63	18.2	2.72	20.7	3.10	13.5	3.15	15.8	
9-8	1 PM	1.85	22.3	2.66	22.4	2.64	18.2	2.71	20.8	3.09	13.7	3.15	15.6	
12-2	11 AM	1.81	22.1	2.64	22.4	2.64	18.0	2.70	20.7	3.07	13.6	3.14	15.6	
5-27-54	2 PM	1.79		2.58		2.55		2.67		3.06		3.10		*

* These elevations taken after completion of Embankment, Roadbed Treatment and Base.

Trial Paint Stripe

Alton Vordenbaum, Maintenance Superintendent
District 15

In the January, 1954, issue of Texas Highways, an article on Paint Stripe on Concrete Pavement was published.

As stated in the article, District 15 placed an aggregate stripe and applied the paint on top of this as soon as the excess stone had been whipped off. This paint stripe was placed on a section of U. S. 181, from the Bexar-Wilson County Line to the intersection with the Business Route, five miles northwest of Floresville, on a trial basis on April 1, 1953.

We have made both day and night inspections of this paint stripe and find that after sixteen months, it is still very serviceable.

Max W. Moore, Assistant District Engineer
District 24

U. S. Highway 62 and 180 in District 24 was located through a pass in the Hueco Mountains 25 miles or so east of El Paso in 1929. Traffic on this section has increased from 550 v. p. d. in 1947 to 1, 200 v. p. d. in 1953. This road consisted generally of an 18-foot penetration surface on a 24-foot crown through the Hueco Mountains with ascending grades of 3 per cent to 6.5 per cent for a distance of four miles. One of the many curves had a central angle of 167 degrees with a degree of curvature of 14°00'. The road rises from elevation 4550 at the west end of the project to elevation 5190 at the east end. Since this road carries a large volume of truck traffic, many irate tourists were forced to creep this four-mile distance behind a crawling truck. In addition to this inconvenience and loss of time, our maintenance forces had difficulty in the winter when these grades and curves were iced over.

In December, 1953, a contract was awarded to Hugh McMillan, of El Paso, for the reconstruction of this 4. 2 miles

Cut Number 5, the deepest cut, is 67 feet on the high side to the subgrade.

Starting a 35-foot fill over the old road between Cuts 3 and 4.

Looking downhill through Cut 1. The masonry inlet to pipe culvert shows on the right at the oil drum.

Bulldozers building ramp from Cut 4 into fill. The old road in the immediate foreground will be 35 feet below the new grade.

View looking downhill from Cut 3, through Cut 2 to Cut 1, on new location. The old highway shows at left.

Here, a bulldozer is clearing Cut 4.

at a bid price of $387,248.46. This section was relocated along the same general route but with an entirely new alignment. It was impractical to lower the grades to any extent, but the maximum curvature was reduced to 6°00' and the total number of curves was reduced. The completed section provides for two twelve-foot ascending lanes and one twelve-foot descending lane on a 52-foot crown. Base and pavement consist of crushed caliche-gravel and 200 pounds per square yard of Type C hot-mix asphaltic concrete. Shoulders will receive a single asphalt surface treatment.

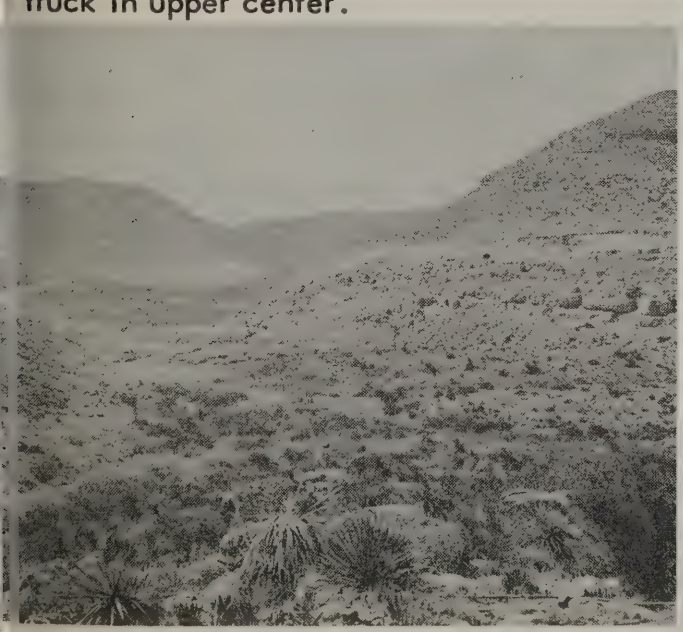
The major item in this contract is the 190,000 cubic yards of rock road excavation. This excavation is concentrated in six cuts with a usual haul of about 500 feet. The bid price for this item is $1.02 per cubic yard. The rock is largely a blue dolomitic limestone with a Los Angeles wear of about 25 per cent. It usually lays in horizontal strata and is not particularly difficult to drill and shoot. One cut however, containing 35,000 cubic

yards, did give some trouble in that it was through a talus slope consisting of five- to ten-cubic-yard boulders surrounded by clays. This required much secondary drilling and shooting and causes us some concern as to the stability of the steep backslope. The contractor is using two 600-cubic foot air compressors, one 500-cubic foot air compressor, and three smaller sizes with the six wagon drills in the large cuts. The excavated rock is moved with a one and one-half-cubic yard shovel and three Koering Dumpsters. Two D-8 and two D-7 Dozers work the rock into the embankment layers.

One of the Highway Department's problems was handling traffic through the canyon during construction. The new location crosses the present road in four places, and on grades above or below the old. One backfill crosses the present road approximately 35 feet above present grade. However, a sequence of work was followed, along with the construction of a short detour connection which required only an

This picture was made just prior to closing the old road where the new location crosses it. The special detour can be seen near the truck in upper center.

Uphill end of special detour cut from Cut 3 to connection with old highway.



Looking down Pow Wow Canyon from a point near Cut 4.

Here, the old highway on the left is being closed to start the 35-foot fill over the old grade. The uphill end of the special detour is on the right.

This view shows part of the relocation, including Cuts 1, 2, and 3, with the old highway winding up the hill.

General over-all view.

additional 4,000 cubic yards of rock excavation, that has inconvenienced the public very little.

As of July 1, the project was 60 per cent complete with 47 per cent of the time used. L. E. Wood is the Resident Engineer in charge of the work and is assisted by Ed Smith, Senior Engineering Assistant, and Roy Long, Senior Inspector.

The Hueco Mountains are a low barren range composed mostly of stratified sedimentary rocks of Paleozoic age which rise 1,000 feet above the Hueco Bolson to the west and the Diablo Plateau to the southeast. The major structural feature is an arch trending northwestward. In the northern part of the range, the sedimentary rocks are cut by numerous masses of intrusive igneous rock of probable Tertiary age. These are syenite porphyries and trachytes. Faulting in the mountains has produced distinct topographic features such as steep escarpments with many undrained depressions on the depressed sides of the fault blocks. Limestones comprise 80 per cent of the Hueco Mountains.

What a Little Improvement Can Do . . .

E.M. Ruth, Assistant District Engineer
District 16

These pictures show the recent improvements made in a roadside park located approximately 2.8 miles north of Goliad on U.S. 183.

The park site has been available for several years, but was not improved. Two units consisting of a table, benches, and incinerator were installed at this location.

Plans for this roadside park improvement were prepared by Rudolph Riefkogel, Senior Landscape Adviser, Maintenance Operations Division. The park was built by A. D. Lopez, Senior Maintenance Foreman, Goliad County.

Before

After

Before

After

Before

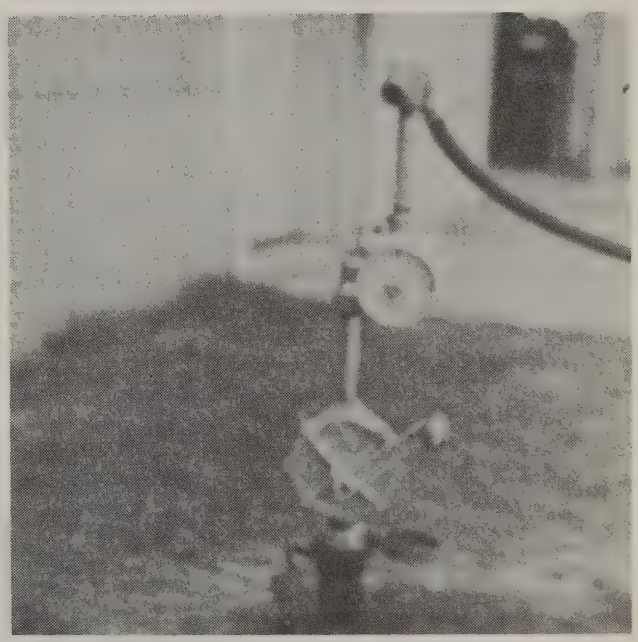
After

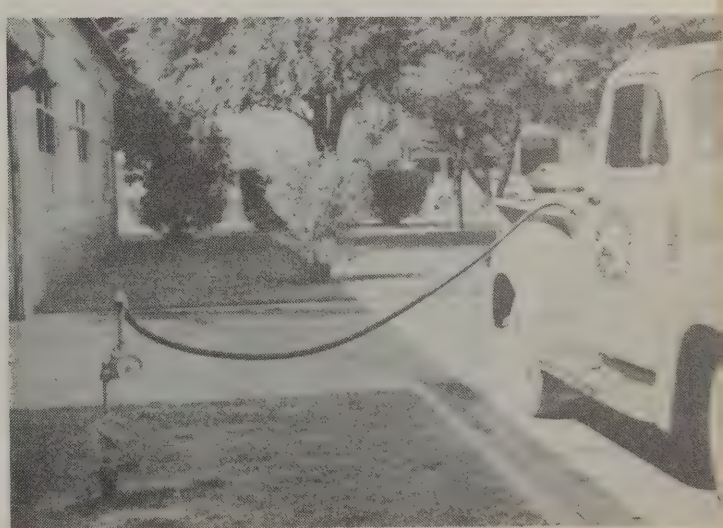
Foresight

R.N. Jennings, District Maintenance Engineer
District 7

During the recent flood at Ozona, power failure made our electric gasoline pumps useless and obtaining gasoline became a serious problem.

R. A. McCulloch, while Maintenance Engineer in District 6, had foreseen this problem and had given instructions that manual pumps be placed at all gasoline tanks where electric pumps were used. This district is preparing to also take this precaution.





From the beginning of civilization, men have sought to commemorate those whom they want future generations to remember. The trend in the United States today is to erect "living memorials" to honor those who served and died in World War II.

Such a living monument is the Blue Star Memorial Highway which runs through Texas. Sponsored jointly by the Texas Highway Department and the Texas Garden Clubs, Inc., the project seeks to beautify the areas along the designated highway by the planting of wild flowers and the development of such things as roadside parks and turnouts, lookouts, bird sanctuaries, and forests.

Blue Star Memorial Highway Monument on U.S. Highways 77, 377, and 81.

Blue Star Memorial Highway Monument at Canutillo near El Paso on U.S. 80.

The idea began as the Blue Star Drive in New Jersey in 1946, and has spread to all the other states. A specific project of The National Council of State Garden Clubs, the highway was named for the blue star of the service flag. Veterans' organizations and conservation groups also back the project.

Blue Star Highways span the United States, with each state included in the network. One east-west route begins in Maine and extends across the country through the central states into California. The other seven are north-south routes.

Each state develops its own memorials, using native materials in the way best suited to its own environment. This assures economy both in the original work of beautification and in follow-up maintenance work. The Garden Clubs designate the routes and buy the markers, and the Highway Department erects and maintains them.

In Texas the highways include U. S. 77 from the Oklahoma state line north of Gainesville to Denton; U. S. 377 from Denton to Fort Worth; and U. S. 81 from Fort Worth to Laredo.

Markers have been erected at Gainesville, Fort Worth, Waco, Austin, San Antonio, and Laredo. Another Blue Star Memorial Highway ends at El Paso, and a marker has been placed at that site.

The 30,000 members of the Texas Garden Clubs, Inc., were so well organized to carry out the program that the Highway Commission waived the provision of delaying designation of a memorial highway a year from the date of acceptance by the sponsoring agency. In 1947 the highway was designated; it was dedicated in 1950.

Planting along the Texas Blue Star Memorial Highway, while naturalistic in design, follows a well-conceived landscape plan. Plants are chosen which are hardy and easy to care for.

Thus Texas, along with the other states, is helping to create and maintain beauty along this highway as a monument to the men and women who served in the armed forces of the United States in World War II, as a "living memorial" to them.

Combination
INCINERATOR AND DISPOSAL WELL

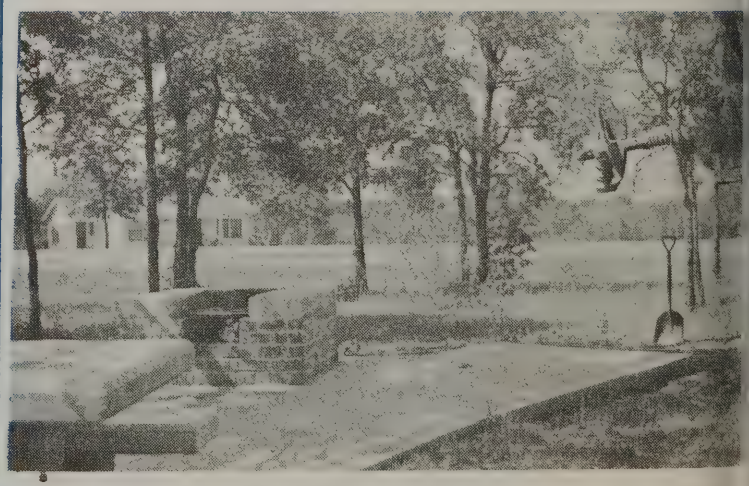
E.M. Pritchard, Assistant District Engineer
District 23

With the increased use of parks and the high cost of maintenance operations everyone sooner or later becomes conscious of methods of reducing maintenance costs. The disposal of trash in our roadside parks has always been a problem, and most of the time a rather unpleasant task -- especially during watermelon time. Many innovations have been tried along the line of building installations for disposing of trash.

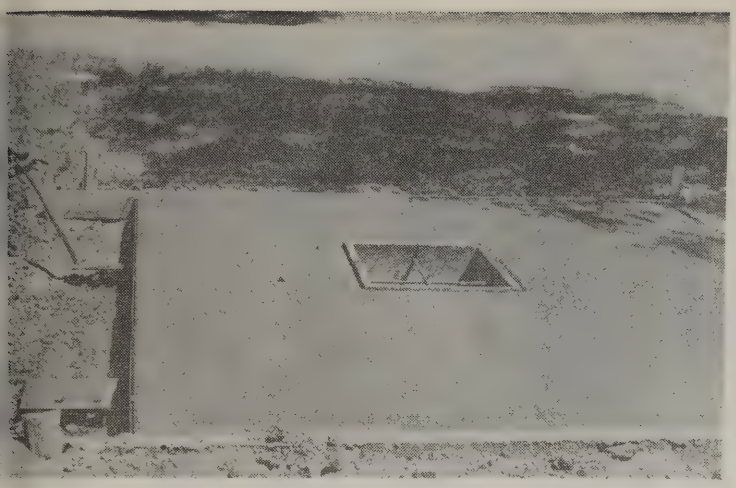
Last year Porter McCarroll, Senior Maintenance Foreman at Comanche, became rather conscious of the very unpleasant task of cleaning incinerators which were filled with watermelon every day. It was then decided something should be done about the problem. Why should this trash be manhandled, loaded into trucks, and then hauled to a dump

This is a familiar sight in many roadside parks.

In this type of incinerator, the material has to be cleaned from the incinerator, loaded onto a truck, and then disposed of.



This disposal well, 30 inches in diameter, is amply deep and is drilled at the desired location. Our machine will allow us to drill to a depth of about sixteen feet.



Construction of this incinerator is according to our present standard, with two changes made. The opening in the center is sixteen inches square with two bars embedded in the concrete, giving eight-inch grills to prevent a person or bulky material from falling through. Grader blades are placed under the base to move the unit over a new disposal well when one fills up. In some cases, we have inserted a three-foot section of 30-inch corrugated pipe in the top three feet of the well where the caving of soil was a problem. The corrugated pipe, where used, is not tied into the concrete base.

Large containers will not fall through the eight-inch grill, requiring that they be burned. This reduces the volume and gives the maximum capacity in the disposal well.

Completed unit in operation.

ground? Why not bury it? With a core drilling machine in the district, we decided that we could bore a disposal well and build a standard incinerator over the top with an opening in the floor to let the trash fall through. We started with the parks on the current Roadside Development Program and built some of these units on an experimental basis. Thus far, they are very satisfactory and we have not found a single objectionable feature in them. The following series of photographs will better illustrate the idea.

Since these photographs were taken, we have ceased building the circular type incinerator and have adopted a square-type model with several slight improvements. This new design can be found on a standard blueprint that will be printed in the near future.

Salt for WEED KILLER

J.D. Willson, Senior Maintenance Superintendent
District 5

Above, a maintenance crew in Parmer County spreads salt on a patch of bindweed on Farm Road 299, eleven miles south of Friona.

With this shop-made spreader box salt can be applied at the rate of from three to nine pounds per square yard.

This crew, composed of Lloyd Killough, J. W. Gooch, C. J. James, A. L. Honey, and Alfred Mills, works under the supervision of R. D. Rogers, Senior Maintenance Foreman at Dimmitt.

Ted Karber, Senior Maintenance Foreman
District 24

While District 24 is not troubled with ice and snow as frequently as some parts of the state, we do have an average of two or three storms during the winter months which give a great deal of trouble, particularly in the mountainous sections. Grades up to 9.75 per cent in the Guadalupe and Davis Mountains become impassable even in light snows unless snow is removed before becoming packed. As is usually the case, direct traffic bridges and overpasses become iced over quickly with any shower during the winter.

Each Section Foreman maintains a 20- or 30-cubic yard stockpile of salt-sand mixture at the critical points in his section. These stockpiles are replenished every summer. In addition, each foreman usually keeps a small amount of sacked pure salt at his warehouse for other emergencies. In this area we have been paying from $8 to $10 per ton for salt. The district as a whole uses about forty tons per year.

The usual practice here in building a stockpile is to place about fifteen cubic yards of coarse sand or screenings on the ground and mix in a five-ton load of salt with a front end loader. This three to one mix usually receives a few rains during the summer months and the salt coats the sand particles and, in our opinion, gives better results and goes further than using pure salt.

We usually spread this mixture on the iced grade, curve, or structure by having two men ride the dump bed of the slow-moving truck and scatter the mix, although it can be applied by cracking the end gate of the dump bed. Ordinarily a three-cubic yard load is sufficient to cover about one-fourth mile of two-lane road. If the ice or packed snow is fairly light, it will usually melt and be thrown off the road under traffic in an hour or two. In any case it will embed itself in the ice and provide traction immediately.

● ● ●

RESOLUTION OF SYMPATHY

The resolution passed at the Twenty-eighth Annual Short Course in memory of deceased associates erred in listing T.C. Cage. The list should have recognized J.F. Cage.

PERSONNEL CHANGES

H. L. Arno, Director of Personnel

District 6

County Residency, Andrews, to County Residency, Kermit: Benjamin C. Sides, Senior Resident Engineer, transferred September 1, 1954.

District 12

County Residency, Rosenberg: R. T. Roane changed from Resident Engineer to Senior Resident Engineer September 1, 1954.

District Headquarters, Houston: Cecil M. Trent Jr., changed from Designing Engineer to Senior Designing Engineer September 1, 1954.

District 14

County Residency, Bastrop, to District Headquarters, Austin: Joe Gresham, Senior Resident Engineer, transferred as District Construction Engineer October 1, 1954.

District 15

District Headquarters, San Antonio: Alton Vordenbaum changed from Maintenance Superintendent to Senior Maintenance Superintendent November 1, 1954.

Expressway, San Antonio: John J. Fuller changed from Senior Designing Engineer to Supervising Designing Engineer October 1, 1954.

Expressway, San Antonio: R. O. Lytton changed from Supervising Construction Engineer to Assistant Expressway Engineer October 1, 1954.

Expressway, San Antonio: W. C. Raby changed from Senior Resident Engineer to Supervising Field Engineer October 1, 1954.

District 20

County Residency, Port Arthur, to County Residency, Anahuac: V. O. Ellis, Senior Resident Engineer, transferred September 1, 1954.

District 21

County Residency, Laredo, to District Headquarters, Pharr: W. J. Apperson, Planning Engineer on modified service, transferred September 1, 1954.

Bridge Division, Austin

Warren A. Grasso changed from Designing Engineer to Senior Designing Engineer September 1, 1954.

E. A. Jelinek changed from Senior Designing Engineer to Supervising Designing Engineer September 1, 1954.

Materials and Tests Division, Austin

John E. Hunt changed from Soils Engineer to Senior Soils Engineer November 1, 1954.

H. A. Meier changed from Soils Engineer to Senior Field Engineer November 1, 1954.

Road Design Division, Austin

A. H. Christian changed from Supervising Designing Engineer to Assistant Engineer Road Design November 1, 1954.

ROSTER FOR EMERGENCY CALLS

R.N. Jennings, District Maintenance Engineer
District 7

District 7 has been periodically preparing a roster of maintenance employees who are readily available to meet emergencies on our highways. This roster is furnished to the Highway Patrol and offices of all sheriffs in this district. This listing of men by localities with their telephone numbers should materially reduce time needed to get Highway Department employees to that section of road where their presence is required.

The list of maintenance personnel is also used as a telephone directory within the district.

The following men are available for call to meet emergencies occurring on highways in District 7. *Maintenance Foremen.

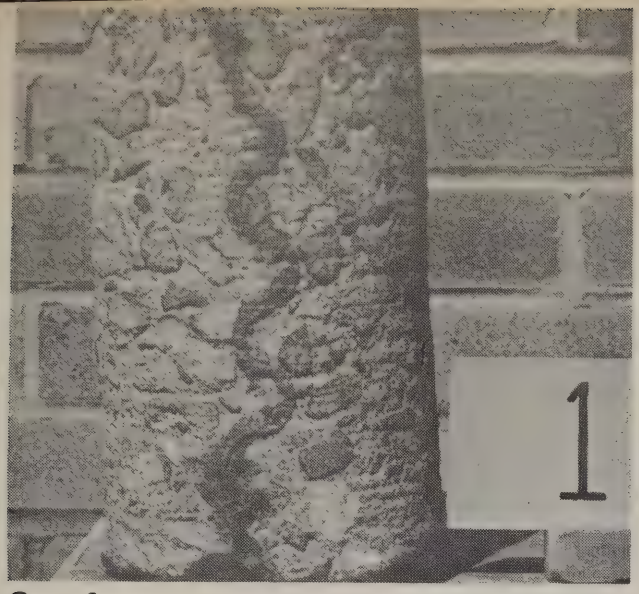
Ballinger	Warehouse	Telephone	3664
Ballinger	H. P. Largent *		6571
Ballinger	C. W. Scarbrough		7353
Ballinger	Toni Queen		4854
Ballinger	C. C. Neff		6619
Barnhart	Warehouse		731
Barnhart	Everett Roe *		351
Barnhart	Walter Fisher		751
Barnhart	G. W. Newman		851
Barnhart	Henry Cox		951
Bronte	Warehouse		14
Bronte	J. I. Murtishaw		8912
Bronte	Hollis E. Stevens		9402
Bronte	A. E. Rusk		231
Eden	Warehouse		285
Eden	Henry Pierce *		311-J
Eden	Joe Prosise		286-J
Eden	Frank Sessom		154-W
Eldorado	Warehouse		22101
Eldorado	C. O. Neff		24591
Eldorado	C. M. Jeffrey		24956
Garden City	Warehouse		37
Garden City	H. E. Null		78
Junction	Warehouse		250
Junction	Hubert Fields *		167
Junction	M. Hunsucker		23
Junction	Gene Jones		1603F111
Junction	A. M. Burrier		279
Junction	W. L. Taylor		143
Junction	Bill Cunningham		892
Menard	Warehouse		90
Menard	Clayton Davis		375-W
Menard	Frank Baker		230-J
Ozona	Warehouse		214
Ozona	Scottie Houston *		62-J
Ozona	Ivy Smith		306-J
Ozona	L. L. Dragoo		80-J
San Angelo	Warehouse		21436
San Angelo	W. H. Hopewell *		87792
San Angelo	W. E. Macek		22244-4
San Angelo	Earl Key		22254-1
San Angelo	George Potter		8686-5
San Angelo	E. H. Otte		3861-4
San Angelo	H. C. Pinkston		8777-5
Sonora	Warehouse		25531
Sonora	Cullen Luttrell *		25481
Sonora	C. W. West		27042
Sonora	John Bell		22361
Sterling City	Warehouse		274
Sterling City	Jim Butler *		144
Sterling City	R. F. Burns		147
Sterling City	T. J. Finnigan		106
San Angelo	W. A. Vannoy, Equipment Supervisor		22370-4
San Angelo	Hollis Gill, Construction Foreman		21168-5
San Angelo	Joe W. Henson, Construction Foreman		5615-4

CORRUGATED METAL JOINTS

Douglas Faith, Associate Resident Engineer
District 12

Corrugated metal forms were installed for the contraction joints in the concrete pavement on Farm Highway 1093 in Harris County, constructed under State Project C-1258-4-2. The roadway section consists of two 24 1/2-foot lanes of concrete pavement separated by a fourteen-foot esplanade. In the construction of the regular width pavement, the contractor installed the corrugated metal contraction joint by using a machine powered to travel on the paving forms. The installation of the metal joint was made behind the transverse finishing machine and ahead of the longitudinal finishing machine. The machine used in installing the metal strip was powered by a gasoline engine which also furnished power for the hydraulic equipment used in placing the corrugated metal and for the generators supplying electrical power for the vibrators used in vibrating the metal strip into place. This machine is owned by Flexible Road Joint Company, Warren, Ohio, who has exclusive rights to all patents in connection therewith, and who installs the metal joint on a lease basis.

A three-eighths-inch by fourteen-inch steel plate mounted on moving supports so guided as to hold the plate in a vertical plane while vibrating the metal strip into the concrete, and to hold in horizontal position while attaching the metal strip to the plate, was used to support and guide the 28-gauge metal being placed. Fourteen prong clamps at variable spacing were used to secure the metal to the plate for support. These prong clamps each had one edge shaped to fit the corrugations of the metal. They were operated by the partial rotation of a round steel shaft into which each clamp was bolted. Hydraulic equipment turned the shaft, providing power for the clamp to secure the metal strip to the plate, and also to release the clamps after the metal had been placed in the concrete. Four three-fourths-horsepower electric motors, each equipped with an eccentric-mounted flywheel, and each mounted on top with two steel angles supporting the steel plate, were used for vibrating the plate and attached form into place. Power for the four motors was furnished by a 240-volt, 50-ampere, 3-phase, 60-

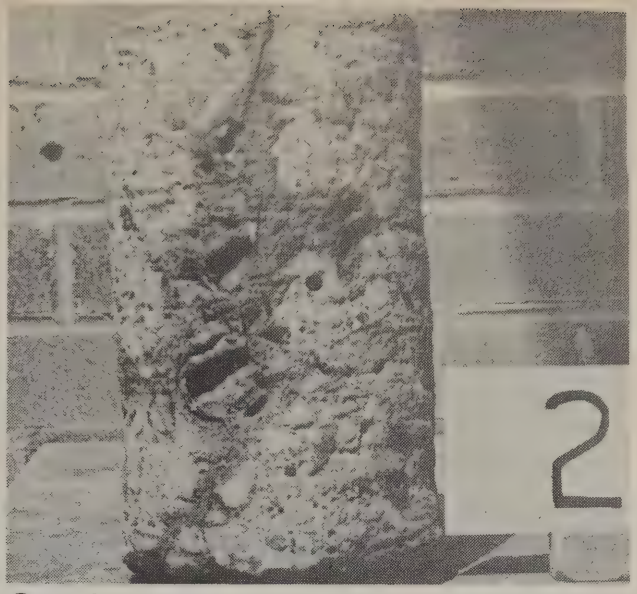


Core 1

This core was taken from the second joint installed on the second day of paving operations. A solid steel plate was used for support of the joint form and vibration was done with the plate vibrators alone.

Location: Seven feet, three inches right of the center line of left lane at Station 114 + 61.

Core depth: Ten and one-fourth inches.



Core 2

This joint was installed using the same method as used in placing the joint represented by Core 1. Note the honeycomb in three corrugations on the plate side of the metal joint forms.

Location: Six feet, three inches right of the center line of right lane at Station 134 + 38.

Core depth: Ten inches.

Core 3

This joint was installed with openings cut in the steel plate to allow concrete to fill in on both sides of the form as it was being installed. Location of the core was made to show the condition at the center of an opening as cut in the plate. All corrugations seem to be filled with concrete but, due to lack of support from the plate, the lower edge of the joint form is displaced two inches.

Location: Seven feet, four inches left of the center line of left lane at Station 139 + 50.

Core depth: Ten and three-sixteenths inches.

Core 4

The contraction joint represented by this core had been installed using the same method as used in placing the joint represented by Core 3. The cores were taken from the same relative location in the two joints. The metal joint form shows displacement in alignment but very little displacement in the lower edge as shown in photographs of Core 3.

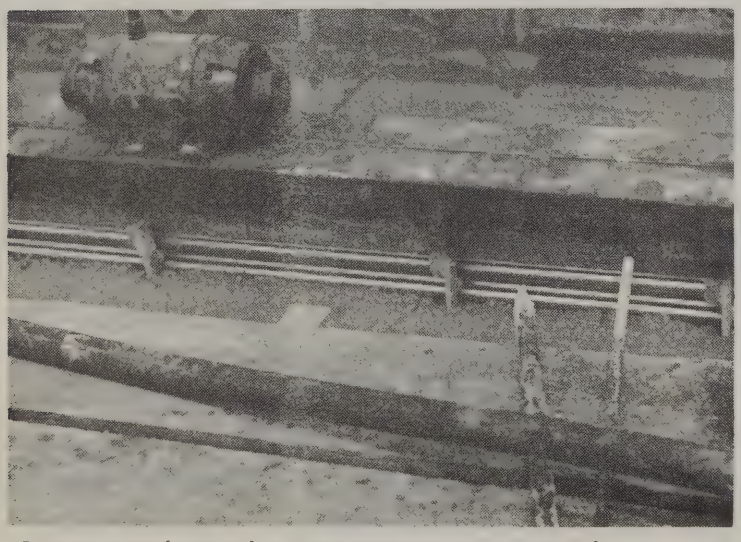
Location: Seven feet, four inches left of the center line of left lane at Station 142 + 50.

Core depth: Nine and seven-eighths inches.

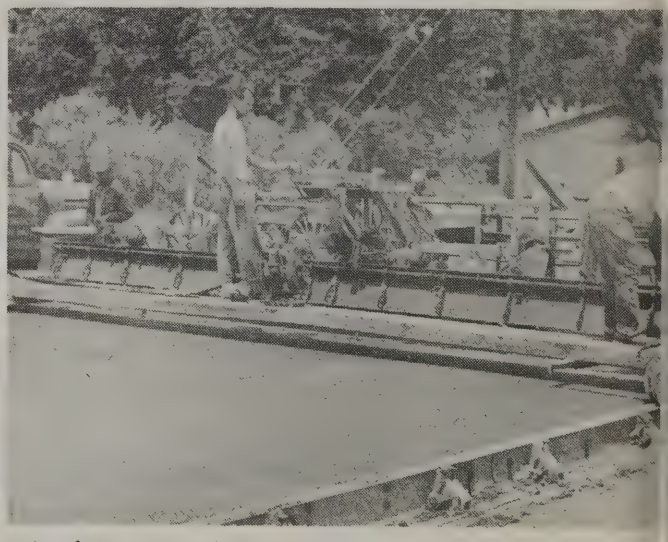
cycle, 5-KW generator driven by a V-belt drive from the gasoline engine.

The surface of each lane of the concrete pavement was required to be finished on a straight-line transverse slope. The fourteen-inch steel plate was longer than the 24 1/2-foot pavement width, and was notched at each end to fit the top of the paving forms. When the plate was vibrated into the concrete and the paving forms were engaged in the notch of the plate, the penetration of the plate could be controlled. This, in turn, would control the depth at which the metal strip was placed in the concrete. At the beginning of paving operations, an effort was made to place the top of the metal strip not less than one-eighth inch and not more than one-fourth inch below the finished concrete surface. Inspection of early jointing indicated that in order to prevent spalling of concrete above the top of metal strip, the plate should be placed very near the surface. It is probable that the variation of one-eighth inch to one-fourth inch depth below surface will be satisfactory, as we doubt that more rigid control of this depth is feasible.

At the beginning of paving operations, the metal strip was guided and set with the steel plate being vibrated. The clamps were then released and the plate withdrawn with the vibrator still in operation. Vibration of the steel plate during withdrawal was done to aid in eliminating concrete voids on the plate side of the corrugations following removal of the plate guide. The removal of the plate is a tedious operation and deserves particular attention. Done too rapidly, it produces a tendency of the metal joint to follow the plate as it is removed. Contraction joints formed by this method are represented by photographs of cores Number 1 and 2. These photographs show that variable results may be expected in normal use of this method of vibrating, and while two cores admittedly are not enough to develop any conclusive evidence, they do indicate the hazards involved. Due to the possibility of improper consolidation on the plate side of the metal strip, and also to the tendency of the metal form to follow the vibrating plate as it was removed from the concrete, it was decided to try a metal



Corrugated metal contraction joint form being set by machine. The form is shown clamped to the steel plate and being vibrated into place. One of the four mounted vibrators is shown in operation.



Machine used in installing the corrugated metal contraction joint form. A joint has just been installed and the plate is being withdrawn. The workman at right has been placing or holding the form in place with a piece of reinforcing steel. The solid steel plate used in installing the metal form had been reinstalled at the time this photograph was made.

plate with sections of the lower portion cut out to allow only some six inches of backing at each clamp. Photographs Number 3 and 4 show cores placed in this manner. You will note that here again two cores are not sufficient to permit any conclusions. Core Number 3 shows considerable distortion caused, apparently, by attempting to force the metal joint into the concrete without benefit of solid guide plate. Core Number 4 shows a creditable joint placed with the plate cut at intervals as indicated above. Small coarse aggregate was used in the concrete on this project, and it is logical to assume that greater distortion in the metal joint, as represented by Core Number 3, could be expected in those cases where larger coarse aggregate is used. We cannot state categorically that the solid guide plate is the answer, but in our opinion, it is better than the notched guide plate.

Based on our experience on this project, we feel that the following procedure will obtain satisfactory results in the vibrating of corrugated metal joints into place:

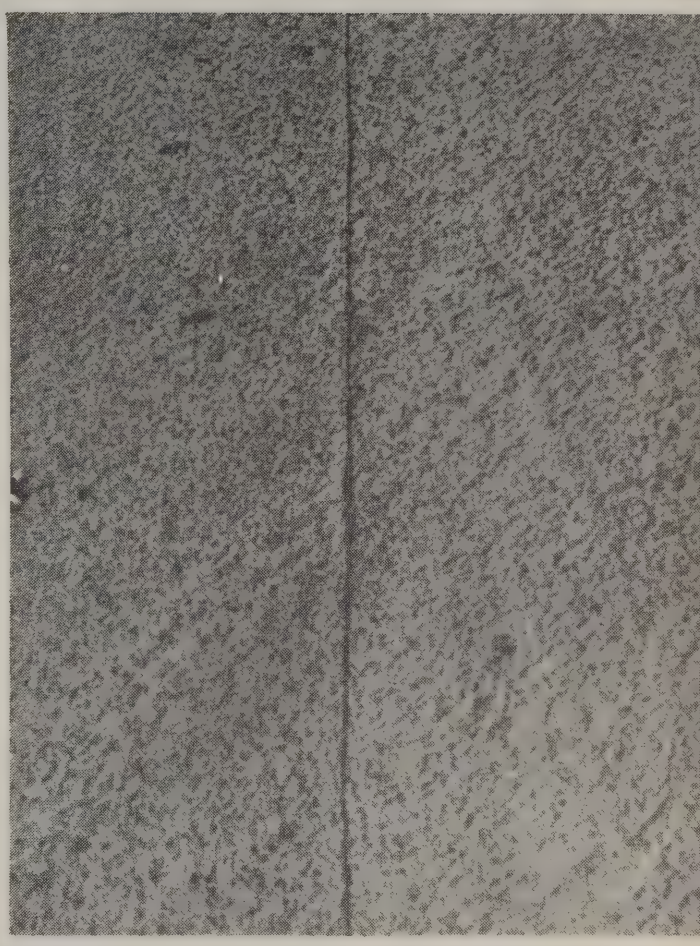
(1) With the corrugated metal strip clamped to the steel plate and at least four plate vibrators operating, the metal strip is set into place. This vibration will enable the steel plate to properly guide the strip in place, and will also fill the corrugations on one side of the form.

(2) Stop vibrators and release the clamps from corrugations of the metal strip.

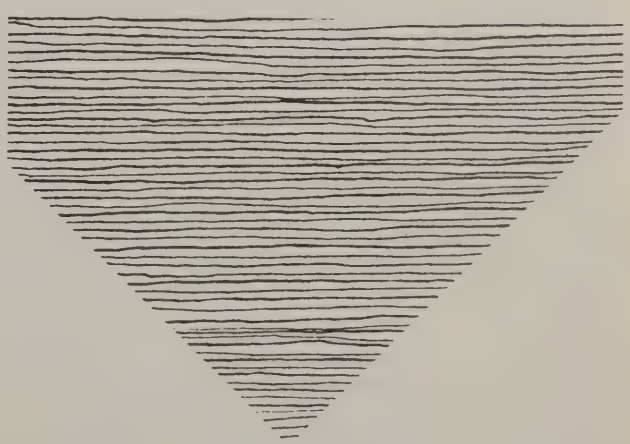
(3) With the plate still backing up the form, run the vibrators for three to five seconds. This vibration will fill the concrete voids displaced by the clamps.

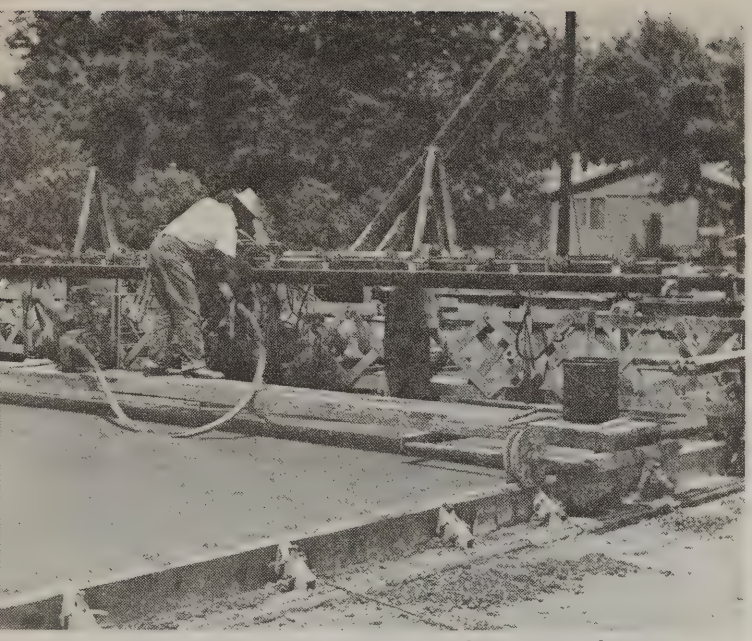
(4) After the vibrators have been stopped, allow the plate and strip to remain in place undisturbed for 20 to 30 seconds. This will cause the concrete to form a more plastic grip on the metal corrugations and hold the strip in place.

(5) Slowly raise the plate to approximately half depth and operate

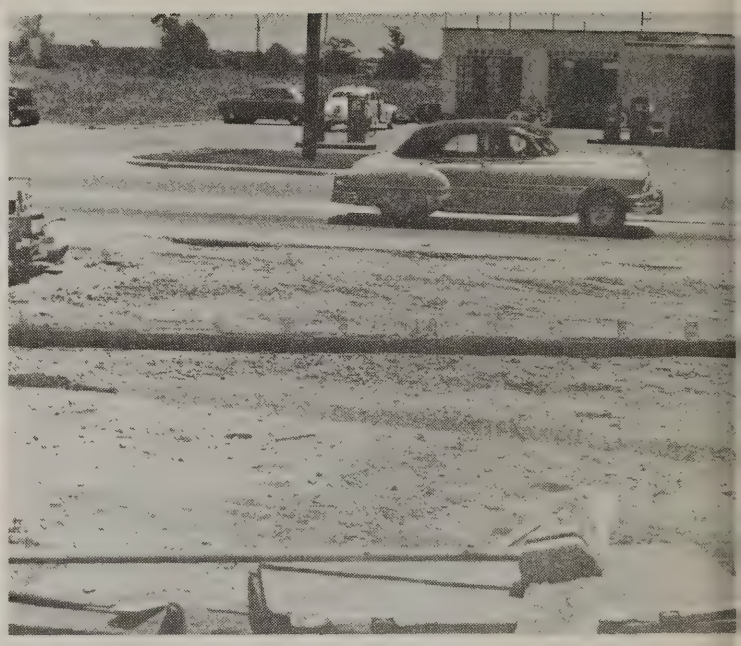


Concrete pavement surface at a contraction joint. The view is from an edge of the slab looking toward the center and the line of sight is oblique to the surface of the pavement. The surface is shown magnified in the foreground as compared to the surface in the background.





Another view of the machine used in installing the corrugated metal contraction joint forms. The machine is shown with the steel plate in a horizontal position ready for another metal form to be clamped in place for the next joint. The workman is using a hand-held mechanical vibrator to vibrate the concrete on the plate side of the form after the plate has been removed.



Steel plate used on the machine for installing the corrugated metal contraction joint forms. Here, the plate has been removed and openings are shown as cut in the plate. The plate is standing in an inverted position as shown in this photograph.

vibrators for three to five seconds to fill the lower corrugations on the plate side of the strip.

(6) After the vibrators have been stopped, again allow the plate to remain in place for ten to fifteen seconds so that the concrete will obtain more grip on the corrugations of the strip.

(7) Raise the plate until its lower edge is within about one and one-half inch of the top of the strip. Begin the vibrators and operate for three to five seconds. The vibrators may be stopped and the plate removed from the concrete, or the plate may be removed while the vibrators are in operation.

(8) For better assurance of a joint that will perform as designed, it is recommended that a hand-held mechanical vibrator now be used for the full length and depth of the strip on the side that has been covered by the steel plate. (The front side of the plate has received sufficient vibration from previous operations.)

(9) After the longitudinal float has passed over the joint, use a pointing trowel to open the joint by laying the concrete surface back on each side of the metal strip for inspection. Slight adjustments can now be made as to the grade and alignment of the metal strip. By using a hand float, the joint may now be covered with surface mortar and all sizeable aggregate removed from directly over the metal strip in the event it has been installed below the finished surface of the concrete.

. . . I thank you very much. I receive your bulletin monthly and regularly. It contains very helpful information and good ideas in many phases of construction and maintenance.

I always remember the good days I spent in the state and the best people I met in my life.

A. Karim
Roads & Bridges Department
Cairo, Egypt

. . . Your local Texas drivers are the worst in the U. S. They positively DO NOT obey stop signs on arterial highways -- dash right into traffic hell-bent -- never stop to look if there is a vehicle already in the lane they want to enter. And thousands of stop signs are missing entirely from approaches to arterial highways.

Driving through Texas towns and cities is a hazardous undertaking at all times. The open highways on the other hand are fine -- until we come to an approach or lane entering same.

Charles Broad
Chicago, Illinois

. . . Texas is too small. If your very excellent Highway Commission should take over the roads in Louisiana, Mississippi, Alabama, and Georgia we could have good roads from coast to coast.

This next criticism may be captious, but it does seem to me that all the states are out of step except Texas.

Why could you not have the solid line in the right-hand lane where "no-passing" is in force. I drove through 30 states on this just-completed trip, and Texas is the ONLY state in step, with "no-passing" indicated by broken line instead of solid.

I think Texas is pretty wonderful.

Frederick D. Powers
Commander, U. S. N. (Ret.)
Imperial Beach, California

. . . Each time my husband and I have passed your office and warehouses for the last two years I have been tempted to stop and tell you how I enjoy the landscaping and maintenance of your flower beds and lawns, both there and at the traffic circle. Today we did stop but your office must close at noon on Saturday. I wanted especially to ask you where I might buy some yellow cannas like those you have used in traffic circle for the past two years.

My husband and I are amateur gardeners landscaping the first home we have ever owned but we recognize real gardening when we see it and the day we get our yard to compare with the Brownwood office of the Highway Department we will have reached our ambition. We are not the only ones here that feel that way for we have heard other compliments on it, so many people must appreciate it.

Mrs. R.L. Murphy
Cottonwood, Texas

. . . State Highway truck going too fast - covered our car with mud - chipped windshield . . .

Mr. and Mrs. Robert Getz
Carmel Valley, California

. . . I have the Official Highway Travel Map of Texas for 1951 which I carried to Japan for two and one-half years and kept posted on the wall for teaching and bragging about Texas. Being as it's getting old and torn I'd like to trade it for the latest map you have.

My roommate was from Baytown so we stood up for Texas and had our room boy believing all our tales of the Greatest State. It was really fun.

Leonard A. Smith
Mineral Wells, Texas

. . . I wanted to let you know how much we appreciated the splendid cooperation of James Lott and Charles Smith of your Amarillo district office.

The movie scenes of five Texas city signs that we needed to do went off very nicely, indeed, due to the fine assistance given us by everyone at the Amarillo office.

John P. Breeden Jr.
Office of Public Relations
Motion Picture Section
Ford Motor Company